

10/511109

DT04 Rec'd PCT/PTO 12 OCT 2004

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1-67. (Cancelled)

68. (New) A recycled thermoplastic resin, comprising:
about 20 to about 99.9 parts by weight of one or more polymers of a primary polymer type;
about 0.1 to about 40 parts by weight of residual additives; and
one or more polymers of one or more secondary polymer types that are dissimilar to the primary polymer type, the one or more polymers of secondary polymer types including one or more of from 0 to about 79 parts by weight of one or more polymers of one or more secondary polymer types that are compatible with the first polymer type or from 0 to about 40 parts by weight of one or more polymers of one or more second polymer types that are incompatible with the first polymer type;
wherein the polymers of the primary polymer type or the secondary polymer types include two or more grades of polymers.

69. (New) The resin of claim 68, wherein the two or more grades of polymers are characterized by different molecular weights, different molecular composition or different polymer structure.

70. (New) The resin of claim 68, wherein one or more of the polymers of the primary or secondary polymer types exhibits detectible oxidation resulting from aging.

71. (New) The resin of claim 68, wherein the residual additives include bromine and antimony, where the ratio of bromine to antimony is between about 1:1 and 10:1, and the bromine and the antimony are present at combined levels of about 1 ppm to about 5% by weight.

72. (New) The resin of claim 68, wherein the residual additives include titanium dioxide at levels between about 0.5% by weight and about 5% by weight.

73. (New) The resin of claim 68, wherein the residual additives include carbon black at levels between about 0.1% by weight and about 3% by weight.

74. (New) The resin of claim 68, wherein the residual additives include one or more additional pigments or organic dye colorants at levels between about 1 ppm by weight and about 0.1% by weight.

75. (New) The resin of claim 68, wherein the residual additives include two or more elements selected from the group consisting of Cd, Pb, Hg, Cr and Ni, the one or more elements being present at levels between about 0.1 ppm and 100 ppm.

76. (New) The resin of claim 68, wherein the residual additives include two or more additives selected from the group consisting of antioxidants, heat stabilizers, UV stabilizers, flame retardants, antistatics, blowing agents, impact modifiers, compatibilizers, fillers, fiber reinforcements, fluorescent whiteners, and lubricants, wherein the two or more additives are inconsistent or incompatible with one another or the primary polymer type.

77. (New) The resin of claim 68, wherein:
the one or more polymers of the primary polymer type include an impact modified styrene acrylonitrile copolymer that comprises about 80 to about 99 parts by weight of the resin;

a first polymer of the one or more secondary polymer types is a styrene acrylonitrile copolymer that comprises about 0 to about 19 parts by weight of the resin;
the residual additives comprise about 2 to about 7 parts by weight of the resin;
and

a second polymer of the one or more secondary polymer types comprises about 0 to about 7 parts by weight of the resin.

78. (New) The resin of claim 77, wherein the resin has the following properties:
a density of about 1.06 to about 1.10 grams per cubic centimeter, as determined by ASTM D 792;
a melt flow rate of about 2 to about 9 grams per 10 minutes, as determined by ASTM D 1238;
a tensile stress at yield of about 36 to about 48 MPa, as determined by ASTM D 638; and
a notched Izod impact (3.2 mm notch) of about 85 to about 200 Joules per meter, as determined by ASTM D 256.

79. (New) The resin of claim 77, wherein:
one or more of the polymers of the primary or secondary polymer types are a blend of polycarbonate with an impact modified styrene acrylonitrile copolymer, a copolymer blend of styrene acrylonitrile and acrylate polymers, a polysulfone, a copolymer of styrene and acrylonitrile, polycarbonate, polyvinyl chloride, or polyurethane.

80. (New) The resin of claim 77, wherein a second polymer of the one or more secondary polymer types includes polystyrene, an impact modified polystyrene, a polyolefin, a polyurethane, a nylon, polyphenylene ether, polycarbonate, polyethylene terephthalate or polybutylene terephthalate.

81. (New) The resin of claim 77, wherein at least one polymer of the one or more secondary polymer types is a HIPS polymer, where the HIPS polymer is present in the resin in a substantial amount to achieve a user selected notched izod impact strength.

82. (New) The resin of claim 68, wherein:
the one or more polymers of the primary polymer type includes an impact modified styrene polymer that comprises about 70 to about 99 parts by weight of the resin;
a first polymer of the one or more secondary polymer types is a general purpose polystyrene that comprises about 0 to about 10 parts by weight of the resin;
the residual additives comprise about 1 to about 5 parts by weight of the resin;
and
a second polymer of the one or more secondary polymer types comprises 0 to about 29 parts by weight of the resin.

83. (New) The resin of claim 82, wherein:
the second polymer of the one or more secondary polymer types is an acrylonitrile butadiene styrene terpolymer, polyolefin, polyurethane, nylon, polyphenylene ether, or polycarbonate.

84. (New) The resin of claim 82, wherein said resin has the following properties:
a density of about 1.04 to about 1.08 grams per cubic centimeter, as determined by ASTM D 792;
a melt flow rate of about 2 to about 8 grams per 10 minutes, as determined by ASTM D 1238;
a tensile stress at yield of about 20 to about 27 MPa, as determined by ASTM D 638; and
a notched Izod impact of about 60 to about 120 Joules per meter, as determined by ASTM D 256.

85. (New) The resin of claim 68, wherein:
the one or more polymers of the primary polymer type includes a polypropylene that comprises about 88 to about 99 parts by weight of the resin;
a first polymer of the one or more secondary polymer types comprises 0 to about 5 parts by weight of the resin;
the residual additives comprise about 1 to about 5 parts by weight of the resin;
a second polymer of the one or more secondary polymer types comprises 0 to about 7 parts by weight of the resin; and
the resin has distinct melting points at about 125°C and at about 164°C.

86. (New) The resin of claim 85, wherein the polymers of the one or more secondary polymer types include an acrylonitrile butadiene styrene terpolymer, polystyrene, an impact modified polystyrene, or polyethylene.

87. (New) The resin of claim 85, wherein said resin has the following properties:
a density of about 0.92 to about 0.96 grams per cubic centimeter, as determined by ASTM D 792;
a melt flow rate of about 20 to about 30 grams per 10 minutes, as determined by ASTM D 1238;
a tensile stress at yield of about 20 to about 28 MPa, as determined by ASTM D 638; and
a notched Izod impact (3.2 mm notch) of about 50 to about 100 Joules per meter, as determined by ASTM D 256.

88. (New) The resin of claim 68, wherein:
the one or more polymers of the primary polymer type include a polycarbonate that comprises about 20 to about 98 parts by weight of the resin;
a first polymer of the one or more secondary polymer types comprises 0 to about

93 parts by weight of an impact modified styrene acrylonitrile copolymer;
the residual additives comprise about 2 to about 10 parts by weight of the resin;
and
a second polymer of the one or more secondary polymer types comprises 0 to
about 10 parts by weight of the resin.

89. (New) A method of preparing a recycled thermoplastic material, the method comprising:
selecting one or more waste plastic materials based on the sources of the waste plastic materials; and
combining the selected waste plastic materials to achieve a recycled plastic material having one or more predetermined properties.

90. (New) The method of claim 89, wherein selecting one or more waste plastic materials includes selecting waste plastic materials based on a geographic source, wherein the geographic source includes at least one of the group consisting of North America, Europe and Asia.

91. (New) The method of claim 89, wherein selecting one or more waste plastic materials includes selecting a waste plastic material from a source consisting of office automation equipment, white goods, consumer electronics, automotive shredder residue, packaging waste, household waste and building waste and post industrial molding and extrusion scrap.

92. (New) A method of preparing a recycled plastic material, comprising:
providing waste plastic material;
separating the waste plastic material into two or more primary groups of plastic materials;

determining amounts of a first group of the primary groups of plastic materials and at least one other plastic material to provide one or more predetermined properties of a recycled plastic material; and

combining the first group of the primary groups of plastic materials and the at least one other plastic material in the determined amounts to provide the recycled plastic material.

93. (New) The method of claim 92, wherein combining the first group of the primary groups of plastic materials and the at least one other plastic material includes combining the first group of the primary groups of plastic materials with a second group of the one or more primary groups of plastic materials.

94. (New) The method of claim 92, further comprising:
separating a second group of the one or more primary groups of plastic materials into a two or more secondary groups of plastic materials;

wherein the step of combining the first group of the primary groups of plastic materials and the at least one other plastic material includes combining the first group of the primary groups of plastic materials with a group of the secondary groups of plastic materials.

95. (New) The method of claim 92, wherein combining the first group of primary groups of plastic materials and the at least one plastic material includes combining the first group of of primary groups of plastic materials with a virgin plastic.

96. (New) The method of claim 92, wherein combining the first group of primary groups of plastic materials and the at least one plastic material includes combining at least two plastic materials where each plastic is of a different primary polymer type.

97. (New) The method of claim 92, wherein at the first group of primary groups of plastic materials includes a primary polymer and a second group of primary groups of plastic materials includes the primary polymer type, the first group is distinguishable from the second group based on one or more properties of the primary group of plastic material.

98. (New) The method of claim 92, further comprising compounding an additive or a polymer with the recycled plastic material.

99. (New) The method of claim 92, wherein determining amounts includes determining amounts of a first type of ABS material and a second type of ABS material that are combined to form a recycled plastic material having a notched izod impact strength higher than the notched izod impact strength of both the first type of ABS material and the second type of ABS material.

100. (New) The method of claim 92, wherein determining amounts includes determining amounts of an ABS material and a HIPS material that are combined to form a recycled plastic material having an increased tensile strength relative to a tensile strength of the HIPS material.

101. (New) The method of claim 92, wherein determining amounts includes determining amounts of a modified PPO material and a HIPS material that are combined to form a recycled plastic material having an increased notched izod impact strength and tensile strength and decreased melt flow rate relative to the HIPS material.

102. (New) The method of claim 92, wherein determining amounts includes determining amounts of an ABS material and a PC material that are combined to form a recycled plastic material having an increased notched izod impact strength and tensile strength relative to the ABS material.

103. (New) The method of claim 92, wherein determining amounts includes determining amounts of an ABS material and a regrind flame retarded PC material that are combined to form a recycled plastic material having an increased tensile strength relative to the ABS material.

104. (New) The method of claim 92, wherein determining amounts includes determining amounts of an ABS material and a PC/ABS material that can be combined to form a recycled plastic material having an increased notched izod impact strength and tensile strength relative to the ABS material.

105. (New) The method of claim 92, wherein determining amounts includes determining amounts of grades of ABS materials to form a recycled plastic material with a predetermined SAN content, wherein the predetermined SAN content is sufficient to achieve one or more predetermined properties, the properties including one of environmental stress crack resistance, tensile strength, impact strength, melt flow rate of the recycled plastic material.

106. (New) The method of claim 92, wherein determining amounts includes determining amounts of a first type of ABS material and a second type of ABS material that are combined to form a recycled plastic material having a notched izod impact strength higher than the notched izod impact strength of the first type of ABS material lower than the second type of ABS material.

107. (New) The method of claim 92, further comprising:
selecting a secondary polymer that is compatible with the at least one of the plurality of primary groups of plastic materials and the at least one other plastic material; and
combining the secondary polymer with the at least one of the plurality of primary groups of plastic materials and the at least one other plastic material.

108. (New) The method of claim 107, wherein:
determining amounts of at least one of the plurality of primary groups of plastic materials includes determining amounts of polypropylene; and
selecting a secondary polymer includes selecting polypropylene, a low density polyethylene or a polymer with which polypropylene is compatible.

109. (New) The method of claim 107, wherein:
determining amounts of at least one of the plurality of primary groups of plastic materials includes determining amounts of polycarbonate; and
selecting a secondary polymer includes selecting polycarbonate, PC/ABS, an acrylonitrile butadiene styrene terpolymer, an acrylonitrile styrene acrylate copolymer or another polymer with which polycarbonate is compatible.

110. (New) The method of claim 107, wherein:
determining amounts of at least one of the plurality of primary groups of plastic materials includes determining amounts of HIPS; and
selecting a secondary polymer includes selecting an impact modified styrene polymer, a general purpose polystyrene, a modified polyphenylene ether or another polymer with which HIPS is compatible.

111. (New) The method of claim 92, further comprising forming a pellet from the recycled plastic material.

112. (New) The method of claim 92, further comprising extruding a sheet of the recycled plastic material.

113. (New) The method of claim 112 further comprising co-extruding the recycled plastic material with layers containing one or more polymers, including impact modified styrene

acrylonitrile copolymer, blends of polycarbonate with an impact modified styrene acrylonitrile copolymer, copolymer blends of styrene acrylonitrile and acrylate polymers, polysulfone, copolymers of styrene and acrylonitrile, polycarbonate, polyvinyl chloride, polyurethane, high impact styrene copolymers or polyolefins.

114. (New) The method of claim 92 further comprising co-injection molding the recycled plastic material with layers containing one or more polymers, including impact modified styrene acrylonitrile copolymer, blends of polycarbonate with an impact modified styrene acrylonitrile copolymer, copolymer blends of styrene acrylonitrile and acrylate polymers, polysulfone, copolymers of styrene and acrylonitrile, polycarbonate, polyvinyl chloride, polyurethane, high impact styrene copolymers or polyolefins.